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(54) A heating device for washing and/or drying machines for laundry.

(57) A heating device for washing and/or drying machines for laundry, comprising a parallelepiped plate (4) made of electrically insulating material having applied to one surface thereof, by the silk screen process or similar procedures, at least one electrical resistor (5) based on electrically conductive metal powders mixed with glass frit, the resistor having a wavy or other pattern.

The plate (4) is placed inside the vessel of the washing or drying machine for laundry and the corresponding terminals (6, 7) of the resistor (5) are then connected with the power supply network of the machine.

One thus obtains an elevated heat radiating capacity of the plate (4) adapted to effect rapid heating of the washing solution or the drying air of the machine in question.

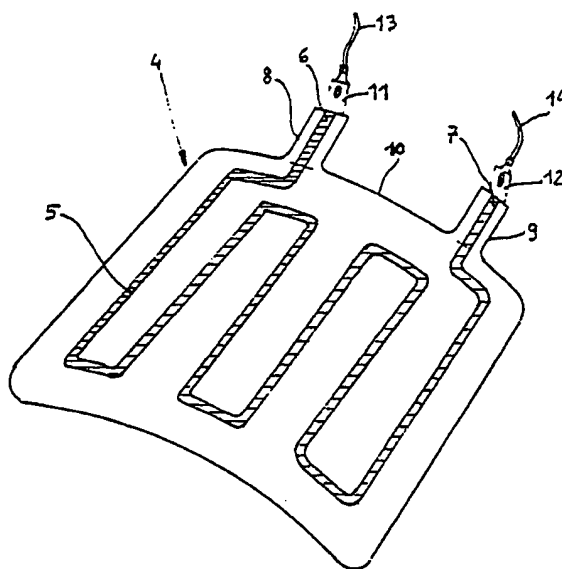


FIG. 1

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A heating device for washing and/or drying machines for laundry

The present invention relates to a heating device of a simple type to be used in washing and/or drying machines for laundry to provide for efficient heating of the washing liquid or the drying air for the laundry in the machine. As is known, conventional washing and/or drying machines for laundry are provided with one or more elements for heating the washing solution or the drying air for the laundry, which are generally realized in the form of electrical resistors of the metal-clad type.

Such electrical resistors are in particular provided with one or more tubular branches of compact dimensions which are fixed to a flange and project therefrom at a short length to allow for connection of the corresponding electric supply lines.

The resistors thus constituted are furthermore mounted in the machine in question through corresponding openings and through the intermediary of sealing gaskets.

The presence of electrical resistors of this type makes it possible to obtain satisfactory heating of the washing solution contained in the vessel of the washing machine, or of the drying air circulating through the drum of the drying machine or of a combined machine for washing and drying laundry, but the application of such resistors is limited due to their constructional shape. Given the relatively limited radiating surface of the heating branches of these resistors, the use thereof does not make it possible to obtain elevated heating powers without overheating the resistors, although this would be desirable in the interests of faster heating of the washing solution or drying air, and thus of shorter durations of the corresponding washing or drying cycles of the machine.

The object of the present invention is therefore to overcome the above-described disadvantages and limits by a heating device for washing and/or drying machines for laundry that is designed so as to provide for efficient and quick heating of the washing liquid or drying air of the machine, and also has elevated heating powers and compact dimensions.

This and other objects are obtained according to the invention by a heating device for washing and/or drying machines for laundry, characterized in that it comprises at least one plate made of electrically insulating material, preferably of a curved parallelepiped shape, and heating means consisting of electrically conductive material applied to at least one surface of the plate according to a predetermined pattern, said plate being applicable in removable fashion within the vessel of the machine and being designed so to allow for

connection to the power supply network of the terminals of the heating means.

The features of the invention will become more evident from the following description, intended solely as a nonrestrictive example, with reference to the adjoined drawings, in which

Fig. 1 shows a perspective view of the inventive heating device;

Figs. 2 and 3 show the device of Fig. 1 applied in a washing machine and in a drying machine for laundry, respectively.

Referring to Fig. 1, one can see that the present heating device comprises substantially a plate 4 of parallelepiped shape and curved with a bending radius so as to fit inside the vessel (not shown) of a washing machine or drying machine of the conventional type. The plate is furthermore preferably realized in steel or another suitable metal material, adequately enameled so as to be electrically insulating, and can also be realized in electrically insulating material of a different type such as ceramic, glass-ceramic or the like. The heating device in question also comprises heating means 5 consisting of electrically conductive material applied to at least one outer surface of plate 4 so as to form a continuous electrical resistor adapted to effect the heating of the washing liquid or drying air, respectively, in the case of a washing machine or drying machine or combined machine for washing and drying laundry.

The electrical resistor is in particular obtained using preferably a conductive mass consisting of electrically conductive metal powders, such as powdered boron, cuprous oxide, cupric oxide, cobalt or nickel oxide, and of glass frit mixed together with variable percentages of the single components in accordance with the desired resistivity, and subsequently subjected to heat treatments in the conventional way.

This conductive mass is applied to the surface of plate 4 preferably by the silk screen process or in any other way known per se, thereby realizing one or more conductive tracks with a predetermined pattern. In the example considered, the resistive track is realized in a wavy shape and extends practically over the entire surface of plate 4, and terminals 6 and 7 of the track are situated in correspondence with parallelepiped projections 8 and 9 extending from lateral edge 10 of the plate, the terminals furthermore being equipped with corresponding plug clamps 11 and 12 or similar connections to allow for connection of the terminals with electric supply lines 13 and 14 of the machine.

Electrical resistor 5 may also be realized in a different way, for example it may consist of con-

ductive metal material applied to the surface of plate 4 by different manufacturing technology, for example by the "thick film" technique, without thereby going beyond the scope of the invention.

Referring now to Fig. 2, which shows the present heating device used within washing vessel 15 of a washing machine to heat the washing liquid for the laundry which is introduced into the vessel, one can see that plate 4 designed as described above is mounted in correspondence with bottom wall 16 of the vessel, and expediently spaced therefrom. The mounting of plate 4 is in particular performed by inserting projections 8 and 9 of the plate through corresponding openings 17, in the vessel, through the intermediary of gaskets 19 for hermetic sealing, and by suitable fixing means known per se and adapted to lock the plate in position in such a way that the projections extend partially outside the vessel to allow for connection of electric supply lines 13 and 14 of the machine with corresponding plug clamps 11 and 12 of the projections and thus with electrical resistor 5.

Fig. 3 shows the present heating device used inside vessel 15 of a combined washing and drying machine for laundry to heat the drying air for the laundry which is produced by a fan 21 connected to the upper part of the vessel. In this case, plate 4 is mounted against the upper wall of vessel 15 expediently spaced therefrom and from drum 22 of the machine, and this mounting is performed in the same ways as described above.

According to the invention, plate 4 and resistor 5 can also be realized in forms other than those described without thereby going beyond the scope of the invention.

Thanks to the ample radiating surface of plate 4, the heating device designed in this way thus makes it possible to obtain elevated heat radiating powers even with relatively low electrical powers, and with compact dimensions of the plate, thereby permitting a homogeneous distribution of the radiant heat in the washing liquid or the drying air to be heated.

Claims

1. A heating device for washing and/or drying machines for laundry, **characterized** in that it comprises at least one plate (4) made of electrically insulating material, preferably of a curved parallelepiped shape, and heating means (5) consisting of electrically conductive material applied to at least one surface of the plate (4) according to a predetermined pattern, said plate (4) being applicable in removable fashion in the vessel (15) of the machine and being designed so to allow for connection to the power supply network of the

terminals (6, 7) of the heating means (5).

2. The heating device of claim 1, **characterized** in that the heating means (5) comprise one or more conductive tracks based on electrically conductive metal powders mixed in variable proportions with glass frit and subjected to heat treatments in the conventional way.

3. The heating device of claim 1, **characterized** in that the plate (4) is provided with projections (8, 9) extending from the lateral edge (10) of the plate and in which the terminals (6, 7) are respectively situated, the projections (8, 9) being insertable through corresponding openings (17) in the vessel (15) through the intermediary of sealing gaskets (19) and being lockable in position by means known per se.

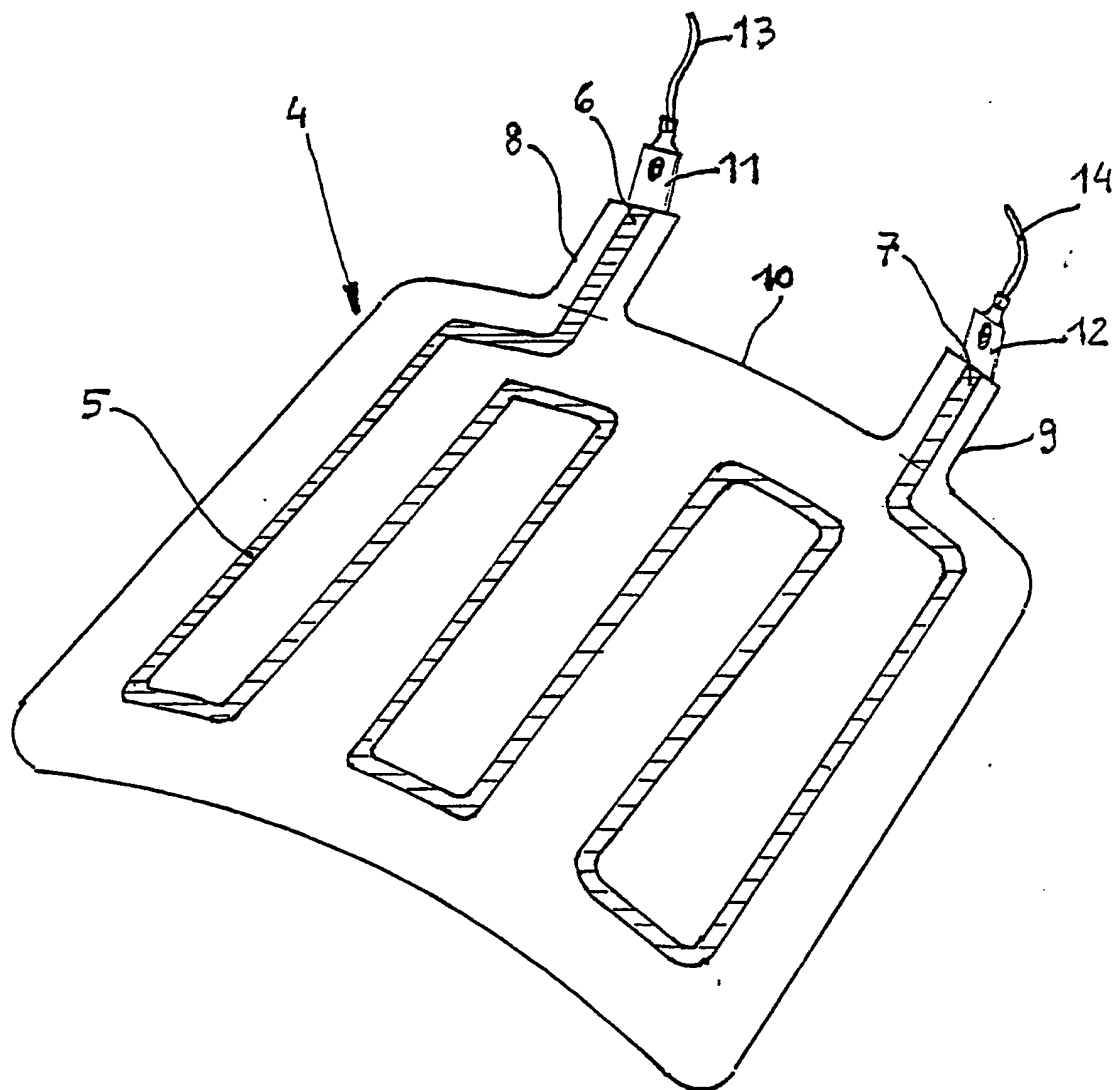


FIG. 1

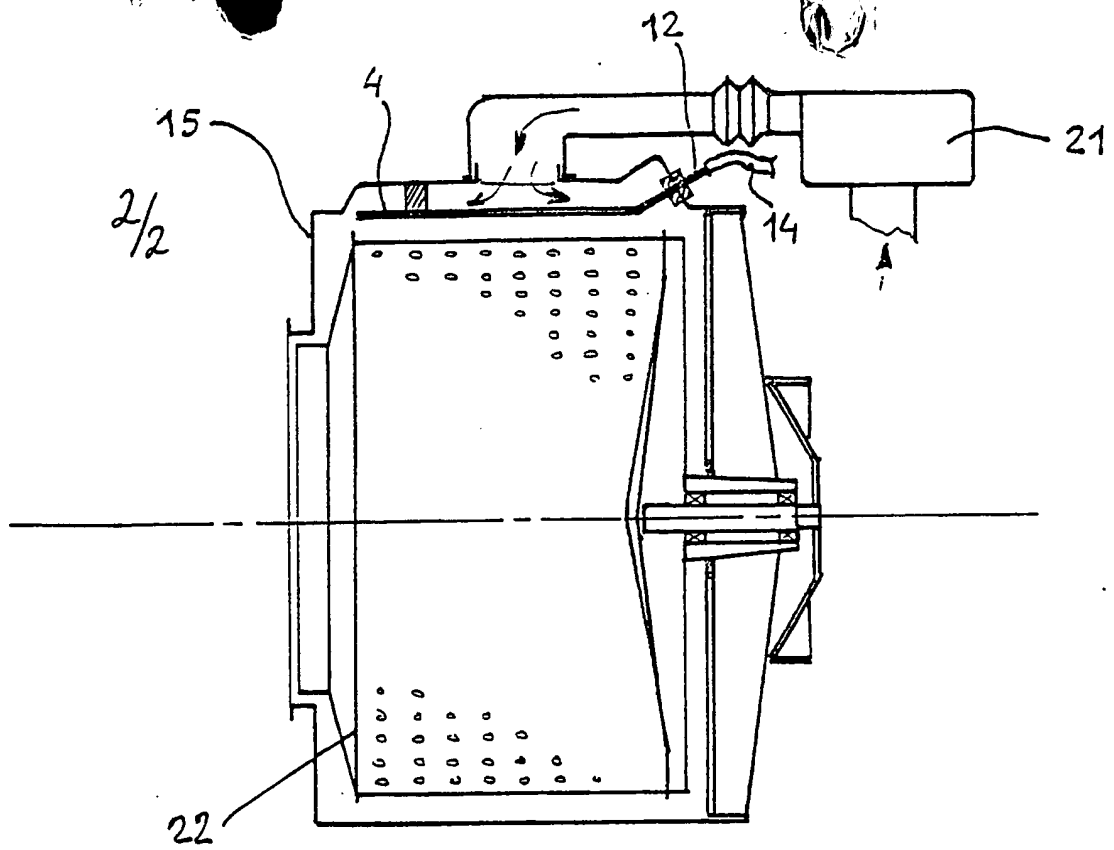


FIG. 3

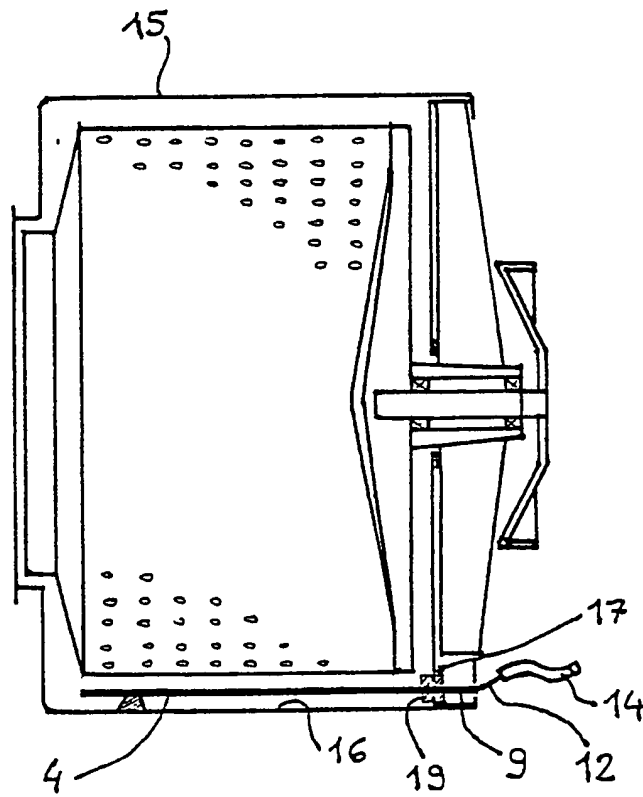


FIG. 2